**Amendments to the Specification:**

Please add the following new heading and paragraph on page 1, after the application title:

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of 10/278,182, filed October 21, 2002, which is a continuation of 09/442,061, filed November 16, 1999, now U.S. Patent No. 6,501,877, which are hereby incorporated by reference in their entirety.

Please delete the heading "APPENDIX" and the two immediately following paragraphs appearing on page 1, lines 2-6.

Please replace the paragraph beginning on page 2, line 28, with the following amended paragraph:

An embodiment of the invention includes a free-space optical train disposed between the input ports and ~~said~~ the output ports, and a routing mechanism. The free-space optical train can include air-spaced elements or can be of generally monolithic construction. The optical train includes a dispersive element such as a diffraction grating, and is configured so that the light from the input port encounters the dispersive element twice before reaching any of the output ports. The routing mechanism includes one or more routing elements and cooperates with the other elements in the optical train to provide optical paths that couple desired subsets of the spectral bands to desired output ports. The routing elements are disposed to intercept the different spectral bands after they have been spatially separated by their first encounter with the dispersive element.

Please replace the two paragraphs at page 5, lines 11-15, with the following amended paragraphs:

Figs. 10B and 10C show the differential path length for a representative path from Fig. 1A; **[[and]]**

Figs. 11A and 11B are schematic top and side views, respectively, of a wavelength router according to an embodiment of the invention that uses a prism as the dispersive ~~element.~~ element;

Please add the following three new paragraphs, to page 5, immediately following the paragraph ending at line 15:

Fig. 12 is a schematic showing a combination of wavelength routers to provide an optical add-drop multiplexer (OADM);

Fig. 13 is a schematic showing a combination of wavelength routers to provide a wavelength-selective cross-connect (WSXC); and

Fig. 14 is a schematic showing a combination of wavelength routers to provide protection switching in a bi-directional line-switched ring (BLSR) optical network.

Please replace the paragraph beginning on page 5, line 24, with the following amended paragraph:

The general functionality of the wavelength router is to accept light having a plurality of (say N) spectral bands at an input port, and selectively direct subsets of the spectral bands to desired ones of a plurality of (say M) output ports. In a specific implementation, N=80 and M=2 (i.e., each of 80 wavelengths is selectively directed to either of two output ports). Most of the discussion will be with reference to dynamic (switching) embodiments where the routing mechanism includes one or more routing elements whose state can be dynamically changed in the field to effect switching. The invention also includes static embodiments in which the routing elements are configured at the time of manufacture or under circumstances where the configuration is intended to remain unchanged during prolonged periods of normal operation.

Please replace the paragraph beginning on page 15, line 1, with the following amended paragraph:

In the plane of Fig. 6B, the beams are focused by lenses 75a and 75b onto the output ports. However, due to the possible angular displacement of each beam by its respective mirror, the beams will be directed to one or another of output ports 15(1 ... M). In Fig. **[[5B]]** 6B, grating 25' and lenses 72b and 72a do not affect the direction of the beams, or whether the beams are diverging, collimated, or converging. The lenses 75a and 75b provide a Fourier relation in the plane of the side view, between mirrors 80(1 ... N) and output ports 15(1 ...M). This Fourier relation maps tilted wavefronts at the mirrors to displaced positions at the output ports.

Please replace the paragraph beginning on page 16, line 20, with the following amended paragraph:

Band Shape and Resolution Issues

The physical positions in the plane of the retroreflector array correspond to frequencies with a scale factor determined by the grating dispersion and the lens focal length. The grating equation is $Nm\lambda = \sin\alpha \pm \sin\beta$ where N is the grating groove frequency, m is the diffraction order, $\lambda$ is the optical wavelength, $\beta$ is the incident optical angle, and $\alpha$ is the diffraction angle. The lens maps the diffraction angle to position, $x$, at its back focal length, $f$, according to the equation $x = f\sin\alpha$. With the mirrors in the back focal plane of the lens, we have a linear relation between position in the mirror plane and the wavelength, $\lambda Nm = x/f \pm \sin\beta$. For a small change in wavelength a change in frequency is proportional to a change in wavelength. This gives us a scale factor between position and frequency of

$\Delta x/\Delta\nu = fNm\lambda^2/c$. The position scale in the mirror plane is thus a frequency scale with this proportionality constant.

Please replace the paragraph beginning on page 17, line 11, with the following amended paragraph:

Fig. 10A shows a preferred substantially trapezoidal band shape. In short, this is achieved by making the resolution of the grating finer than the size of the mirrors sampling the frequency domain. For an extremely large ratio of the grating spot size to the mirror size, the band pass response for each channel would merely be the rectangular response given by the mirror position in the perfectly resolved frequency plane of the grating. For finite grating resolution, the band pass response is a convolution of the spot determined by the diffraction from the grating with the rectangular sampling of the mirror. The result of such a convolution is depicted in Fig. 10A for a grating with a Gaussian like spot with finer resolution in the mirror plane than the mirror size. It is preferred for embodiments of the invention to provide a large ratio of mirror width to grating resolution because the resultant ~~trapeziodal~~ trapezoidal band shapes have a large usable flat top region as compared to the size of the unusable portion between bands, and this makes the utilization of the spectrum more efficient.

Please delete the subheading "Attached Appendix" and the immediately following single paragraph appearing at page 18, lines 1-7

Please add the following new four subheadings and six paragraphs to page 18, beginning at line 1:

System Applications

The following discussion describes a number of systems using multiple wavelength routers incorporated into optical networks. Each of the wavelength routers is shown as having a single input port and two output ports, and for definiteness as being able to handle 80 wavelength channels. In the nomenclature of the above description of the wavelength router, M=2 and N=80. The wavelength routers are designated with suffixed reference numerals 110. A hollow arrow at the top of each wavelength router represents a management interface.

The wavelength routers can be fabricated according to any of the above described embodiments of the invention, or could be fabricated in other ways so long as they provided the functionality of wavelength routing as described herein. In general, as noted above, the light paths within the wavelength routers of the above embodiments of the invention are reversible.

Optical Add-Drop Multiplexer (OADM)

Fig. 12 is a schematic showing an optical add-drop multiplexer (OADM) 120 formed by combining a pair of wavelength routers 110a and 110b in a back-to-back configuration. The general functionality of the OADM is to receive a set of wavelength channels at an input port 132, pass a subset (including all or none) of the wavelengths (the through wavelengths) to an output port 133, divert (drop) those wavelengths not passed from the through path to a drop port 135, receive some or all of the dropped wavelengths (presumably carrying new information) at an add port 137, and combine the added wavelengths with the through wavelengths so that the through and the added wavelengths exit output port 133.

In the back-to-back configuration, input port 132 of OADM 120 is what would be considered the input port of wavelength router 110a while output port 133 of OADM 120 is what would be considered the input port of wavelength router 110b. The through path is effected by coupling the first output ports of the wavelength routers. Drop port 135 and add port 137 are what would be considered the second output ports of the wavelength routers.

Wavelength-Selective Cross-Connect (WSXC)

Fig. 13 is a schematic showing a wavelength-selective cross-connect (WSXC) 140 formed by combining four wavelength routers 110a-110d in a paired back-to-back

configuration. The general functionality of the WSXC is to receive first and second sets of wavelength channels at first and second input ports 142 and 142', and pass selected subsets of the wavelengths on respective through paths to first and second output ports 143 and 143', while exchanging those wavelengths not passed on the through paths. Thus the exchanged wavelengths from input port 142 emerge from exchange output ports 145 and 145' of wavelength routers 110a and 110c and are communicated to exchange input ports 147' and 147 of wavelength routers 110d and 110b, respectively. The exchanged wavelengths entering the exchange input ports are combined for output with the wavelengths on the through paths to emerge from output ports 143 and 143'. Again, as in the case of OADM described above, the output ports of WSXC 140 are what would be considered input ports of wavelength routers 110b and 110d.

Bi-Directional Line-Switched Ring (BLSR) Protection Switching

Fig. 14 is a schematic showing a switching configuration 150 to provide protection switching in a bi-directional line-switched ring (BLSR) optical network. Configuration 150 is formed by combining four wavelength routers 110a-110d in a paired back-to-back configuration along the lines of WSXC 140 described above. This configuration differs from the WSXC in two main respects. First, in the WSXC, both the upper and lower pairs of wavelength routers operate with light traveling in the same direction, while in the switching configuration, the upper and lower pairs handle traffic in opposite directions, arbitrarily denoted "East" and "West." Second, instead of the exchange ports in the WSXC, the switching configuration provides loopback paths 152 and 155. Thus, it is possible to divert a subset of the wavelengths incoming to wavelength router 110a on the East fiber and direct them back onto the West fiber outgoing from wavelength router 110c. Similarly, those wavelengths (or perhaps a different set) that are incoming to wavelength router 110d on the West fiber are diverted and directed back onto the East fiber outgoing from wavelength router 110b.